Package 'hspm'

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Type Package

Title Heterogeneous Spatial Models

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Description Spatial heterogeneity can be specified in various ways. 'hspm' is an ambitious project that aims at implementing various methodologies to control for heterogeneity in spatial models. The current version of 'hspm' deals with spatial and (non-spatial) regimes models. In particular, the package allows to estimate a general spatial regimes model with additional endogenous variables, specified in terms of a spatial lag of the dependent variable, the spatially lagged regressors, and, potentially, a spatially autocorrelated error term. Spatial regime models are estimated by instrumental variables and generalized methods of moments (see Arraiz et al., (2010) <doi:10.1111/j.1467-9787.2009.00618.x>, Bivand and Piras, (2015) <doi:10.18637/jss.v063.i18>, Drukker et al., (2013) <doi:10.1080/07474938.2013.741020>, Kelejian and Prucha, (2010) <doi:10.1016/j.jeconom.2009.10.025>).

Encoding UTF-8

LazyData true

RoxygenNote 7.2.1

Depends R (>= 4.0)

Imports Formula, sphet, stats, spdep, Matrix

Suggests splm

License GPL (>= 2)

URL https://github.com/gpiras/hspm

BugReports https://github.com/gpiras/hspm/issues

NeedsCompilation no

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Repository CRAN

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R topics documented:

`baltim` *Baltimore house sales prices and hedonics*

Description

A dataset containing the prices and other attributes of 211 dwelling in Baltimore, MD

Usage

```
baltim
```

Format

A data frame with 211 rows and 17 variables:

STATION ID variable

PRICE sales price, in 1,000 US dollars (MLS)

NROOM number of rooms

DWELL 1 if detached unit, 0 otherwise

NBATH number of bathrooms

PATIO 1 if patio, 0 otherwise

FIREPL 1 if fireplace, 0 otherwise

AC 1 if air conditioning, 0 otherwise

BMENT 1 if basement, 0 otherwise

NSTOR number of stores

GAR number of car space in garage, (0 = no garage)

AGE age of dwellings in years

CITCOU 1 if dwelling is in Baltimore County, 0 otherwise

LOTSZ lot size in hundreds of square feet

SQFT interior living space in hundreds of square feet

X X coordinate on the Maryland grid

Y Y coordinate on the Maryland grid

...

Source

https://geodacenter.github.io/data-and-lab/

`error_regimes` *Estimation of spatial regimes models*

Description

Estimation of spatial regimes models

Usage

```
error_regimes(
  formula,
  data,
  listw,
  rgv,
  weps_rg = FALSE,
  initial.value = NULL,
  het,
  verbose = FALSE,
  control,
  cl
)

## S3 method for class 'error_regimes'
coef(object, ...)

## S3 method for class 'error_regimes'
vcov(object, ...)

## S3 method for class 'error_regimes'
print(x, digits = max(3, getOption("digits") - 3), ...)

## S3 method for class 'error_regimes'
summary(object, ...)

## S3 method for class 'summary.error_regimes'
print(x, digits = max(5, getOption("digits") - 3), ...)
```

Arguments

formula	a symbolic description of the model of the form y ~ x_f | x_v | wx | h_f | h_v | wh where y is the dependent variable, x_f are the regressors that do not vary by regimes, x_v are the regressors that vary by regimes, wx are the spatially lagged regressors, h_f are the instruments that do not vary by regimes, h_v are the instruments that vary by regimes, wh are the spatially lagged instruments.
data	the data of class data.frame.
listw	a spatial weighting matrix of class listw, matrix or Matrix
rgv	an object of class formula to identify the regime variables
weps_rg	default weps_rg = FALSE, the errors do not vary by regime (see details)
initial.value	initial value for the spatial error parameter
het	heteroskedastic variance-covariance matrix
verbose	print a trace of the optimization
control	argument for optimization
cl	record calls
object	an object of class error_regimes
...	additional arguments
x	an object of class error_regimes
digits	number of digits

Value

An object of class "error_regimes". A list of five elements. The first element of the list contains the estimation results. The other elements are needed for printing.

Examples

```
data("natreg")
data("ws_6")
form <-  HR90  ~ 0 | MA90 + PS90 +
RD90 + UE90 | 0 | 0 | MA90 + PS90 +
RD90 + FH90 + FP89 + GI89 | 0

form1 <-  HR90  ~ MA90 -1 |  PS90 +
RD90 + UE90 | 0 | MA90 -1 |  PS90 +
RD90 + FH90 + FP89 + GI89 | 0

split  <- ~ REGIONS

##############################
# spatial error regimes model #
##############################
mod <- spregimes(formula = form, data = natreg,
rgv = split, listw = ws_6, model = "error", het = TRUE)
summary(mod)
mod1 <- spregimes(formula = form, data = natreg,
```

```
rgv = split, listw = ws_6, model = "error",
weps_rg = TRUE, het = TRUE)
summary(mod1)
mod2 <- spregimes(formula = form1, data = natreg,
rgv = split, listw = ws_6, model = "error", het = TRUE)
summary(mod2)
```

`ivregimes` *Estimation of spatial regimes*

Description

Estimation of spatial regimes

Usage

```
ivregimes(formula, data, rgv = NULL, vc = c("homoskedastic", "robust", "OGMM"))

## S3 method for class 'ivregimes'
coef(object, ...)

## S3 method for class 'ivregimes'
vcov(object, ...)

## S3 method for class 'ivregimes'
print(x, digits = max(3, getOption("digits") - 3), ...)

## S3 method for class 'ivregimes'
summary(object, ...)

## S3 method for class 'summary.ivregimes'
print(x, digits = max(5, getOption("digits") - 3), ...)
```

Arguments

`formula`	a symbolic description of the model of the form `y ~ x_f | x_v | h_f | h_v` where `y` is the dependent variable, `x_f` are the regressors that do not vary by regimes, `x_v` are the regressors that vary by regimes, `h_f` are the fixed instruments and `h_v` are the instruments that vary by regimes.
`data`	the data of class `data.frame`.
`rgv`	an object of class `formula` to identify the regime variables
`vc`	one of `c("homoskedastic", "robust", "OGMM")`. If `"OGMM"` an optimal weighted GMM is used to estimate the VC matrix.
`object`	an object of class ivregime
`...`	additional arguments
`x`	an object of class ivregime
`digits`	number of digits

Details

The model estimated is:

$$y_{ij} = \mathbf{x_{ij,k}}\beta_j + \mathbf{Y_{ij,k}}\gamma_j + \epsilon$$

for i=1,..,n representing the sample observations, and j = 1,..., J representing the regimes

Value

An object of class `ivregimes`. A `list` of five elements. The first element of the list contains the estimation results. The other elements are needed for printing the results.

Author(s)

Gianfranco Piras and Mauricio Sarrias

Examples

```
data("natreg")
form  <- HR90  ~ 0 | MA90 + PS90 + RD90 + UE90 | 0 | MA90 + PS90 + RD90 + FH90 + FP89 + GI89
split  <- ~ REGIONS
mod <- ivregimes(formula = form, data = natreg, rgv = split, vc = "robust")
summary(mod)
mod1 <- ivregimes(formula = form, data = natreg, rgv = split, vc = "OGMM")
summary(mod1)
form1  <- HR90  ~ MA90 + PS90 |  RD90 + UE90 -1 | MA90 + PS90 | RD90 + FH90 + FP89 + GI89 -1
mod2 <- ivregimes(formula = form1, data = natreg, rgv = split, vc = "homoskedastic")
summary(mod2)
```

---

lag_regimes *Estimation of spatial regimes models*

Description

Estimation of spatial regimes models

Usage

```
lag_regimes(formula, data, listw, rgv, het, cl, wy_rg)

## S3 method for class 'lag_regimes'
coef(object, ...)

## S3 method for class 'lag_regimes'
vcov(object, ...)

## S3 method for class 'lag_regimes'
```

```
print(x, digits = max(3, getOption("digits") - 3), ...)

## S3 method for class 'lag_regimes'
summary(object, ...)

## S3 method for class 'summary.lag_regimes'
print(x, digits = max(5, getOption("digits") - 3), ...)
```

Arguments

formula	a symbolic description of the model of the form y ~ x_f | x_v | wx | h_f | h_v | wh where y is the dependent variable, x_f are the regressors that do not vary by regimes, x_v are the regressors that vary by regimes, wx are the spatially lagged regressors, h_f are the instruments that do not vary by regimes, h_v are the instruments that vary by regimes, wh are the spatially lagged instruments.
data	the data of class data.frame.
listw	a spatial weighting matrix of class listw, matrix or Matrix
rgv	an object of class formula to identify the regime variables
het	heteroskedastic variance-covariance matrix
cl	record calls
wy_rg	default wy_rg = FALSE, the lagged dependent variable does not vary by regime (see details)
object	an object of class lag_regime
...	additional arguments
x	an object of class lag_regime
digits	number of digits

Value

an object of class "lag_regimes". A list with six elements. The first element of the list contains the estimation results. The other elements are needed for printing.

Examples

```
data("natreg")
data("ws_6")
form <-  HR90  ~ 0 | MA90 + PS90 +
RD90 + UE90 | 0 | 0 | MA90 + PS90 +
RD90 + FH90 + FP89 + GI89 | 0

form1 <-  HR90  ~ MA90 -1 |  PS90 +
RD90 + UE90 | 0 | MA90 -1 |  PS90 +
RD90 + FH90 + FP89 + GI89 | 0

split  <- ~ REGIONS

##############################
```

```
#  Spatial Lag regimes model  #
################################
mod4 <- spregimes(formula = form, data = natreg,
rgv = split, listw = ws_6, model = "lag",
het = TRUE, wy_rg = TRUE)
summary(mod4)
mod5 <- spregimes(formula = form1, data = natreg,
rgv = split, listw = ws_6, model = "lag",
het = TRUE, wy_rg = TRUE)
summary(mod5)
```

`natreg` *US Counties Homicides*

Description

Continental U.S. counties data for homicides and selected socio-economic characteristics. Data for four decennial census years: 1960, 1970, 1980 and 1990.

Usage

```
natreg
```

Format

A data frame with 3085 rows and 70 variables

REGIONS Regions of the US

NOSOUTH Counties not in the south

POLY_ID Poligon id

NAME Counties names

STATE_NAME State name

STATE_FIPS FIPS code for the state

CNTY_FIPS FIPS code for the county

FIPS state and county FIPS code

STFIPS FIPS code for the state

COFIPS FIPS code for the county

FIPSNO state + county FIPS code

SOUTH dummy indicator: 1 if the county is in the southern US

HR60 homicide rate per 100,000 in 1960

HR70 homicide rate per 100,000 in 1970

HR80 homicide rate per 100,000 in 1980

HR90 homicide rate per 100,000 in 1990

HC60 homicide count, three year average centered on 1960

HC70 homicide count, three year average centered on 1970

HC80 homicide count, three year average centered on 1980

HC90 homicide count, three year average centered on 1990

PO60 county population in 1960

PO70 county population in 1970

PO80 county population in 1980

PO90 county population in 1990

RD60 resource deprivation in 1960

RD70 resource deprivation in 1970

RD80 resource deprivation in 1980

RD90 resource deprivation in 1990

PS60 population structure in 1960

PS70 population structure in 1970

PS80 population structure in 1980

PS90 population structure in 1990

UE60 unemployment rate in 1960

UE70 unemployment rate in 1970

UE80 unemployment rate in 1980

UE90 unemployment rate in 1990

DV60 divorce rate in 1960: pct. males over 14 divorced

DV70 divorce rate in 1970: pct. males over 14 divorced

DV80 divorce rate in 1980: pct. males over 14 divorced

DV90 divorce rate in 1990: pct. males over 14 divorced

MA60 median age in 1960

MA70 median age in 1970

MA80 median age in 1980

MA90 median age in 1990

POL60 log of population in 1960

POL70 log of population in 1970

POL80 log of population in 1980

POL90 log of population in 1990

DNL60 log of population density in 1960

DNL70 log of population density in 1970

DNL80 log of population density in 1980

DNL90 log of population density in 1990

MFIL59 log of median family income in 1959

MFIL69 log of median family income in 1969

MFIL79 log of median family income in 1979

MFIL89 log of median family income in 1989

FP59 pct. families below poverty in 1959

FP69 pct. families below poverty in 1969

FP79 pct. families below poverty in 1979

FP89 pct. families below poverty in 1989

BLK60 pct. black in 1960

BLK70 pct. black in 1970

BLK80 pct. black in 1980

BLK90 pct. black in 1990

GI59 Gini index of family income inequality in 1959

GI69 Gini index of family income inequality in 1969

GI79 Gini index of family income inequality in 1979

GI89 Gini index of family income inequality in 1989

FH60 pct. female headed households in 1960

FH70 pct. female headed households in 1970

FH80 pct. female headed households in 1980

FH90 pct. female headed households in 1990

West West regional dummy

...

Source

https://geodacenter.github.io/data-and-lab/

`ols_regimes` *Estimation of spatial regimes models*

Description

Estimation of spatial regimes models

Usage

```
ols_regimes(formula, data, listw, rgv, het, cl)

## S3 method for class 'ols_regimes'
coef(object, ...)

## S3 method for class 'ols_regimes'
vcov(object, ...)

## S3 method for class 'ols_regimes'
print(x, digits = max(3, getOption("digits") - 3), ...)

## S3 method for class 'ols_regimes'
summary(object, ...)

## S3 method for class 'summary.ols_regimes'
print(x, digits = max(5, getOption("digits") - 3), ...)
```

Arguments

formula	a symbolic description of the model of the form y ~ x_f | x_v | wx | h_f | h_v | wh where y is the dependent variable, x_f are the regressors that do not vary by regimes, x_v are the regressors that vary by regimes, wx are the spatially lagged regressors, h_f are the instruments that do not vary by regimes, h_v are the instruments that vary by regimes, wh are the spatially lagged instruments.
data	the data of class data.frame.
listw	a spatial weighting matrix of class listw, matrix or Matrix
rgv	an object of class formula to identify the regime variables
het	heteroskedastic variance-covariance matrix
cl	record calls
object	an object of class ols_regimes
...	additional arguments
x	an object of class ols_regimes
digits	number of digits

Value

An object of class "ols_regimes". A list of four elements. The first element of the list contains the estimation results. The other elements are needed for printing.

Examples

```
data("natreg")
data("ws_6")

split  <- ~ REGIONS
```

```
form <-  HR90  ~ MA90 -1 |  PS90 +
RD90 + UE90 | MA90 | MA90 -1 |  PS90 +
RD90 + FH90 + FP89 + GI89 | 0

form1 <-  HR90  ~ MA90 -1 |  PS90 +
RD90 + UE90 | MA90 | MA90 -1 |  PS90 +
RD90 + FH90 + FP89 + GI89 | GI89

form2 <-  HR90  ~ MA90 -1 |  PS90 +
RD90 + UE90 | MA90 + RD90 | MA90 -1 |  PS90 +
RD90 + FH90 + FP89 + GI89 | GI89

mod <- spregimes(formula = form, data = natreg,
rgv = split, listw = ws_6, model = "ols")
summary(mod)

mod1 <- spregimes(formula = form1, data = natreg,
rgv = split, listw = ws_6, model = "ols")
summary(mod1)

mod2 <- spregimes(formula = form2, data = natreg,
rgv = split, listw = ws_6, model = "ols")
summary(mod2)
```

`regimes` *Estimation of spatial regimes models*

Description

Estimation of spatial regimes models

Usage

```
regimes(formula, data, rgv = NULL, vc = c("homoskedastic", "groupwise"))

## S3 method for class 'regimes'
coef(object, ...)

## S3 method for class 'regimes'
vcov(object, ...)

## S3 method for class 'regimes'
print(x, digits = max(3, getOption("digits") - 3), ...)

## S3 method for class 'regimes'
summary(object, ...)

## S3 method for class 'summary.regimes'
print(x, digits = max(5, getOption("digits") - 3), ...)
```

Arguments

formula	a symbolic description of the model of the form y ~ x_f | x_v where y is the dependent variable, x_f are the regressors that do not vary by regimes and x_v are the regressors that vary by regimes
data	the data of class data.frame.
rgv	an object of class formula to identify the regime variables
vc	one of c("homoskedastic", "groupwise"). If groupwise, the model VC matrix is estimated by weighted least square.
object	an object of class regime
...	additional arguments
x	an object of class regimes
digits	number of digits

Details

The model estimated is:

$$y_{ij} = \mathbf{x_{ij,k}}\beta_j + \epsilon$$

for i=1,..,n representing the sample observations, and j =1,..., J representing the number of regimes

Value

An object of class lm and regimes. If vc = "groupwise" the model is estimated in two steps and the second steps uses weighted least squares.

Author(s)

Gianfranco Piras and Mauricio Sarrias

Examples

```
data("baltim")
form   <- PRICE  ~ NROOM + NBATH + PATIO + FIREPL + AC + GAR + AGE + LOTSZ + SQFT
split  <- ~ CITCOU
mod <- regimes(formula = form, data = baltim, rgv = split, vc = "groupwise")
summary(mod)
form <- PRICE  ~ AC + AGE + NROOM + PATIO + FIREPL + SQFT | NBATH + GAR + LOTSZ - 1
mod <- regimes(form, baltim, split, vc = "homoskedastic")
summary(mod)
```

sarar_regimes *Estimation of spatial regimes models*

Description

Estimation of spatial regimes models

Usage

```
sarar_regimes(
  formula,
  data,
  listw,
  rgv,
  het,
  weps_rg = weps_rg,
  wy_rg = wy_rg,
  initial.value = NULL,
  verbose = FALSE,
  control,
  cl
)

## S3 method for class 'sarar_regimes'
coef(object, ...)

## S3 method for class 'sarar_regimes'
vcov(object, ...)

## S3 method for class 'sarar_regimes'
print(x, digits = max(3, getOption("digits") - 3), ...)

## S3 method for class 'sarar_regimes'
summary(object, ...)

## S3 method for class 'summary.sarar_regimes'
print(x, digits = max(5, getOption("digits") - 3), ...)
```

Arguments

formula	a symbolic description of the model of the form y ~ x_f | x_v | wx | h_f | h_v | wh where y is the dependent variable, x_f are the regressors that do not vary by regimes, x_v are the regressors that vary by regimes, wx are the spatially lagged regressors, h_f are the instruments that do not vary by regimes, h_v are the instruments that vary by regimes, wh are the spatially lagged instruments.
data	the data of class data.frame.

listw	a spatial weighting matrix of class listw, matrix or Matrix
rgv	an object of class formula to identify the regime variables
het	heteroskedastic variance-covariance matrix
weps_rg	default FALSE, if TRUE the spatial error term varies by regimes (see details)
wy_rg	default wy_rg = FALSE, the lagged dependent variable does not vary by regime (see details)
initial.value	initial value for the spatial error parameter
verbose	print a trace of the optimization
control	argument for optimization
cl	record calls
object	an object of class sarar_regimes
...	additional arguments
x	an object of class sarar_regimes
digits	number of digits

Value

An object of class "sarar_regimes". A list of five elements. The first element of the list contains the estimation results. The other elements are needed for printing.

Examples

```
data("natreg")
data("ws_6")
form <-  HR90  ~ 0 | MA90 + PS90 +
RD90 + UE90 | 0 | 0 | MA90 + PS90 +
RD90 + FH90 + FP89 + GI89 | 0

form1 <-  HR90  ~ MA90 -1 |  PS90 +
RD90 + UE90 | 0 | MA90 -1 |  PS90 +
RD90 + FH90 + FP89 + GI89 | 0

split  <- ~ REGIONS

##############################
# Spatial SARAR regimes model #
##############################
mod6 <- spregimes(formula = form, data = natreg,
rgv = split, listw = ws_6, model = "sarar",
het = TRUE, wy_rg = TRUE, weps_rg = TRUE)
summary(mod6)
mod7 <- spregimes(formula = form, data = natreg,
rgv = split, listw = ws_6, model = "sarar",
het = TRUE, wy_rg = FALSE, weps_rg = FALSE)
summary(mod7)
mod8 <- spregimes(formula = form1, data = natreg,
rgv = split, listw = ws_6, model = "sarar",
```

```
het = TRUE, wy_rg = TRUE, weps_rg = FALSE)
summary(mod8)
```

---

spregimes *Estimation of spatial regimes models*

Description

Estimation of spatial regimes models

Usage

```
spregimes(
  formula,
  data = list(),
  listw,
  rgv = NULL,
  initial.value = NULL,
  verbose = FALSE,
  wy_rg = FALSE,
  weps_rg = FALSE,
  model = c("sarar", "lag", "error", "ols"),
  het = FALSE,
  control = list()
)
```

Arguments

formula	a symbolic description of the model of the form y ~ x_f | x_v | wx | h_f | h_v | wh; where y is the dependent variable, x_f are the regressors that do not vary by regimes, x_v are the regressors that vary by regimes, wx are the spatially lagged regressors, h_f are the instruments that do not vary by regimes, h_v are the instruments that vary by regimes, wh are the spatially lagged instruments.
data	the data of class data.frame.
listw	a spatial weighting matrix of class listw, matrix or Matrix
rgv	an object of class formula to identify the regime variables
initial.value	initial value for the spatial error parameter
verbose	print a trace of the optimization
wy_rg	default wy_rg = FALSE, the lagged dependent variable does not vary by regime (see details)
weps_rg	default weps_rg = FALSE, the errors do not vary by regime (see details)
model	one of model = c("sarar", "lag", "error", "ols")
het	heteroskedastic variance-covariance matrix
control	list of controls for the minimization

Details

The general model contains the spatial lag of the dependent variable, the spatial lag of the regressors, the spatial lag of the errors and possibly additional endogenous variables. `spregimes` estimate all of the nested specifications of this general model. The regressors can be either "fixed" or varying by regime. However, if `weps_rg` is set to TRUE, all the regressors should vary by regime.

Value

An object of class "`lag_regimes`", or `sarar_regimes`, or `error_regimes`

Author(s)

Gianfranco Piras and Mauricio Sarrias

References

Arraiz, I. and Drukker, M.D. and Kelejian, H.H. and Prucha, I.R. (2010) A spatial Cliff-Ord-type Model with Heteroskedastic Innovations: Small and Large Sample Results, *Journal of Regional Sciences*, **50**, pages 592–614.

Drukker, D.M. and Egger, P. and Prucha, I.R. (2013) On Two-step Estimation of a Spatial Auto regressive Model with Autoregressive Disturbances and Endogenous Regressors, *Econometric Review*, **32**, pages 686–733.

Kelejian, H.H. and Prucha, I.R. (2010) Specification and Estimation of Spatial Autoregressive Models with Autoregressive and Heteroskedastic Disturbances, *Journal of Econometrics*, **157**, pages 53–67.

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Gianfranco Piras, Paolo Postiglione (2022). A deeper look at impacts in spatial Durbin model with sphet. *Geographical Analysis*, 54(3), 664-684. https://onlinelibrary.wiley.com/doi/10.1111/gean.12318

Luc Anselin, Sergio J. Rey (2014). *Modern Spatial Econometrics in Practice: A Guide to GeoDa, GeoDaSpace and PySal.* GeoDa Press LLC.

Examples

```
data("natreg")
data("ws_6")
form <-  HR90  ~ 0 | MA90 + PS90 +
RD90 + UE90 | 0 | 0 | MA90 + PS90 +
RD90 + FH90 + FP89 + GI89 | 0

form1 <-  HR90  ~ MA90 -1 |  PS90 +
RD90 + UE90 | 0 | MA90 -1 |  PS90 +
RD90 + FH90 + FP89 + GI89 | 0

split  <- ~ REGIONS
```

```
##############################
# Spatial Error regimes model #
##############################
mod <- spregimes(formula = form, data = natreg,
rgv = split, listw = ws_6, model = "error", het = TRUE)
summary(mod)
mod1 <- spregimes(formula = form, data = natreg,
rgv = split, listw = ws_6, model = "error",
weps_rg = TRUE, het = TRUE)
summary(mod1)
mod2 <- spregimes(formula = form1, data = natreg,
rgv = split, listw = ws_6, model = "error", het = TRUE)
summary(mod2)

##############################
#  Spatial Lag regimes model  #
##############################
mod4 <- spregimes(formula = form, data = natreg,
rgv = split, listw = ws_6, model = "lag",
het = TRUE, wy_rg = TRUE)
summary(mod4)
mod5 <- spregimes(formula = form1, data = natreg,
rgv = split, listw = ws_6, model = "lag",
het = TRUE, wy_rg = TRUE)
summary(mod5)

##############################
# Spatial SARAR regimes model #
##############################
mod6 <- spregimes(formula = form, data = natreg,
rgv = split, listw = ws_6, model = "sarar",
het = TRUE, wy_rg = TRUE, weps_rg = TRUE)
summary(mod6)
mod7 <- spregimes(formula = form, data = natreg,
rgv = split, listw = ws_6, model = "sarar",
het = TRUE, wy_rg = FALSE, weps_rg = FALSE)
summary(mod7)
mod8 <- spregimes(formula = form1, data = natreg,
rgv = split, listw = ws_6, model = "sarar",
het = TRUE, wy_rg = TRUE, weps_rg = FALSE)
summary(mod8)
```

---

ws_6 *US Counties Homicides*

Description

Continental U.S. counties data for homicides and selected socio-economic characteristics. Data for four decennial census years: 1960, 1970, 1980 and 1990.

Usage

```
ws_6
```

Format

A spatial weighting matrix of class `Matrix`

Source

https://geodacenter.github.io/data-and-lab/

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